Open Ocean

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♦ *Priority Issues*:
- Climate forcing of ecosystem
- Anthropogenic perturbations to ecosystem
- Natural system (atmosphere/ocean) import export
- Inter-relationships between trophic levels in photic zone

♦ *Characterization of Priority Questions*:

Long line surveys: How do (climate-related) variations in the strength of the undercurrent and the depth of the thermocline influence ecosystem production and community structure?
Parameters – Physics by examining winds, ocean temperature, salinity, ADCP, nutrients, CFCs; Primary productivity by examining pigments (extracted chl or CTD/underway fluorometer or both), direct measures of primary productivity, POC (chlorophyll and transmissometer), community composition (functional groups); Zooplankton by using hydroacoustics, biomass, depth distribution, size structure, functional groups, mammals, birds
Methods - Moorings, ship surveys (CalCOFI style survey lines), acoustics, AUVs and gliders (which may replace some ship based measurements), satellites, drifters, floats
Spatial Scale - Ship surveys with 20km resolution, 250km offshore. Line 67 should perhaps stay, paired with line 63 (Half Moon Bay) but it is necessary to define the productive area by sampling beyond, varies from 100 to 200km 'wide'; Moorings such as M1 or M2 and M3, potentially finer scale if AUVs, gliders are employed
Temporal Scale - 10 years with review at that time with likely need for extension, important to envisage continuity on climate scales
Frequency - Moorings with sub-daily measurements, ship surveys surveying CalCOFI lines 6 times per year

Existing Data/Programs - There have been some survey of this type in the past, but nothing extant

Mesoscale surveys: How do the variations in the strength of winds and upwelling influence ecosystem production and community structure?

Parameters – Physics including winds, ocean temperature profiles, salinity, surface currents; Primary productivity including Chl (either extracted or underway/profiling fluorometer or all), profiling of underway transmissometer; Zooplankton using total biomass, vertical profiles, size structure, functional taxonomic groups, mammals, birds

Methods - Moorings & CODAR can provide physical and biological precursors to the mesoscale measurements. Resolve spatial and temporal variability and detect event-scale perturbations; Ship surveys with smaller vessels (e.g., Martin), 50 x 50km grid to focus on the bay; Hydroacoustics, zooplankton net tows, OPC, CTDs and underway fluorometer and transmissomoeter; Acoustics for vertical temperature structure/thermocline depth; Standard visual survey methods for mammals and birds

Spatial Scale - 50 x 50km survey area in Monterey Bay, 5km or less resolution

Temporal Scale - 3-5 years, then reassess

Frequency - Sub-seasonal stratified by oceanographic season (6-7 per year, not uniform)

Existing Data/Programs - Some in the past (some baseline data), but nothing extant

Additional Comments - Supports several monitoring and process studies, including HABs, habitat assessment for megafouna, human impact assessment, chemical tracer studies

What are the residence times and dispersal patterns of non-point source pollutants?

Parameters - Chemical species associated with human activities such as NO_3 from agriculture, saline groundwater intrusion effects, urban runoff, pesticides from agriculture, automobile and power plant activities

Methods - Find the correlation with natural tracers of land-sea contact, and observe dissipation away from coastal source, natural Ra223, 224 signal acquired by sea water on beach contact provides a natural tracer of boundary fluxes; Ocean physics for tracer motions

Spatial Scale - Over entire coastline, with emphasis on populated areas, from the coastal boundary to 10 miles out

Temporal Scale - The residence time of waters within Monterey Bay is about 10 days; The mixing pattern of a coastal source tracer is defined by upper ocean physics, and related to tide and wind forcing on a local scale

Frequency - Initial survey to locate hot spots. Seasonal (4-6 per year) afterwards, but try to catch the important signal of extreme events

Existing Data/Programs - One existing data set on the Ra 223, 224 natural signal (MBARI / Univ. of South Carolina), data on other anthropogenic components

Additional Comments - Requirement to connect with well data on land; Information is of great practical importance; The Ra connection is very novel, important new science that can provide a powerful tool

What are the impacts, both positive and negative, of flux of material from the coastal margins?

Parameters - Need to measure separately the solid material being transported in river systems vs. the dissolved load, coherence with on land well samples would also be very useful

Methods - Solid load using satellite pictures of river plumes, coring transects from shore outward; Water samples from rivers and wells
Spatial Scale - Tens of kilometers outward from a finite number of point sources (Salinas and Pajaro rivers)
Temporal Scale - Decadal, span at least two El Niño events
Frequency - Need frequent sampling in rainy season (at least monthly), less frequent in dry season; A response capability in response to extreme events is highly desirable
Existing Data/Programs - Many disjoint efforts, not truly focussed on this question; Dunes and Bluffs (sand load), Bays and Estuaries (water quality), Rocky Intertidal (sewage outfall), Sandy Beaches (sediment transport), Deep Seafloor (sedimentation/cores)
Additional Comments - Important for determining impact of dredge tailings being dumped into Sanctuary; This plan should be correlated with that for similar questions being asked in Sandy Beaches group; This topic should be of interest to the Deep Seafloor, and is being considered by them in addition to this effort

Where are areas of high vs low risk to health of Sanctuary from military exercises and operations?
Parameters - Identify fragile ecosystem elements that could be adversely affected
Methods - Risk assessment of potentially deleterious effects of land sea and air exercises within Sanctuary
Spatial Scale - Of the order of 2km
Temporal Scale - Of the order of 7 days
Frequency - On a case by vase basis
Existing Data/Programs - None
Additional Comments - Provide feedback to DOD to minimize impact on Sanctuary

What are the impacts of acoustic monitoring on the health of the system being studied?
Parameters - Measure ambient acoustic noise levels (0-1000Hz)
Methods - Cabled hydrophone arrays
Spatial Scale - Approaches to SF, rest of Sanctuary
Temporal Scale - Sample continuously at 2000Hz
Frequency - Continuous
Existing Data/Programs - Existing arrays include CoACT at Pt Sur and ATOC at Pioneer Historical shipping noise data sets
Additional Comments - MBNMS needs to preserve the Pioneer array for Sanctuary research and education; Make data available on the web to all; Resolve issues of concern surrounding assumed detrimental effects of acoustic energy on Sanctuary inhabitants